Illuminating the black box of reprogramming.

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Public Summary:
Induced pluripotent stem (iPS) cells are functionally very similar to embryonic stem (ES) cells. They can be obtained by the reprogramming of somatic cells, such as fibroblasts, upon expression of just four DNA binding proteins, Oct4, Sox2, Klf4, and c-Myc. They represent a useful cell type for realizing the potential of regenerative medicine, since they are not subject to the same ethical and practical limitations as ES cells. However currently the efficiency of obtaining these cells is very poor. In this preview article we assess the findings of three recent papers that bring insights into the mechanism of reprogramming. The first two papers isolate intermediates of the process, based primarily on the appearance or lack of cell surface markers. This argues that reprograming is a sequential process. The third paper proves that cells derived from the endoderm and mesoderm are also capable of being reprogrammed, although with different kinetics and efficiency, proposing that the cell of origin may have effects on the process. We present a synthesis of their results and the implications that they have on the mechanism of reprogramming.

Scientific Abstract:
Yamanaka and colleagues, in a Science article currently published online, have generated induced pluripotent stem (iPS) cells from liver and stomach cells, suggesting that transcription factor-induced reprogramming is not restricted to particular cell types (Aoi et al., 2008). These results also provide important insight into the mechanistic basis of reprogramming.